6 PAGES
INCLUDING COVER

TO: JIM CHRISTIANSEN
FAX# 303-312-6897

FROM: PAUL LAMMERS
435-615-5112

RE:

INFORMATION FROM ONE JOB SITE IN PARK CITY THAT MAY BE HELPFUL TO THE WATER SHED INVESTIGATION

(1) SOILS
(2) GROUNDWATER.

AGRA
ENGINEERING GLOBAL SOLUTIONS

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May 2, 2000
Job No. 0-817-002922

Summit Point Construction
P O. Box 681329
Park City, Utah 84068-1329

Attention: Mr. Jeff Coleman

Gentlemen:

Re: Summary Report
Geotechnical and Lead Contamination
Reconnaissance Studies
Proposed Condominium Project
East Side of Park Avenue at Approximately 10th Street
Park City, Utah

1. INTRODUCTION

This summary report presents a summary of our geotechnical and lead contamination reconnaissance studies which we have performed at the site of the proposed condominium project which is located on the east side of Park Avenue at approximately 10th Street in Park City, Utah.

The objectives of this study were to:

1. Define the general subsurface soil and groundwater sequence across the site.
2. Determine concentration of lead in the subsurface soils.
3. Provide preliminary geotechnical and earthwork recommendations based upon the conditions encountered and the projected construction.

This study was requested and authorized by Mr. Jeff Coleman of Summit Point Construction.

2. PROPOSED CONSTRUCTION

A series of three to four-level condominium structures are proposed to be constructed at the site. The lowest level of each structure which may extend as much as three to four feet below grade will

be utilized for parking. This level will be of reinforced concrete construction. Overlying the parking level will be two to three levels of condominium structures. These levels will be of wood-frame and masonry construction. Structural loads will be transmitted down through bearing walls and columns to the supporting foundations.

Surrounding portions of the structures will be at-grade parking and roadway areas. The remaining areas will be landscaped.

3. SITE STUDIES

In order to define and evaluate the subsurface soil across the site, 6 test pits were excavated to depths ranging from 12 to 15 feet and 9 geoprobes extended to depths ranging from 0 to 6 feet. The purpose of the explorations was to define and evaluate the geotechnical characteristics of the subsurface sequence and to obtain samples of the typical soils primarily for lead concentration evaluation.

The field program was under the control and continual supervision of an experienced geologist/environmentalist from our staff.

4. SITE CONDITIONS

4.1 SURFACE

The site can best be divided into three primary areas. The southernmost area consists of a relatively flat to slightly rolling landscaped area associated with and adjacent to the residential development to the immediate south. Landscaped areas are planted with grass with some random trees. The central portion of the site is an at-grade asphalt concrete paved parking lot again associated with the residential development to the south. Just west of the paved area is a tennis court. The northern and by far the lowest topographic portion of the site is open, undeveloped area covered with some low-height mounds of non-engineered fills. Vegetation in this area consists of grasses and weeds with some isolated trees.

4.2 SUBSURFACE CONDITIONS

At the exploration points the site was found to be blanketed by 8.0 to 13.5 feet of random non-engineered fill. The fill consists of pockets and zones of silty gravels with some sands, silty sands with some clay, layers of coal, mixture of silty sands and sandy silts. All of the fill contains random debris including pieces of wood, brick, concrete, rebar, etc. The non-engineered fills will exhibit extremely variable and generally poor engineering characteristics. The fills in many cases are underlain by one to two-foot thick layer of dark brown natural organic silty sand, silty clay soils which represent the original topsoil. The topsoil is, in turn, underlain by dense to very dense silty gravels with some sands and occasional cobbles. The [illegible] soils are natural and will exhibit

high strength and low compressibility characteristics. The overlying topsoil will generally exhibit poor engineering characteristics.

Groundwater was generally encountered at a depth of approximately 10 to 13 feet.

Total lead concentration tests were performed on a series of representative samples of the non-engineered fills and original underlying topsoil. The results of these tests are tabulated below:

Test Pit No.	Depth	Total Lead Concentration (parts per million)
TP-1	6"	1,400
TP-3	6"	2,100
TP-4	4'	1,900
TP-4	12'	110
TP-6	4'	250
TP-6	8'	5,400

5. DISCUSSIONS AND RECOMMENDATIONS

5.1 FOUNDATIONS

Considering the extent and random distribution of the non-engineered fills and the variable concentration of lead primarily within the non-engineered fills, a number of various foundation systems were considered for support of the proposed condominium structures. Based upon our evaluation, two systems appear to be most economical. The first would be to remove all the non-engineered fills and underlying topsoil from an area extending out three to five feet from the perimeter of the proposed structures and then replacing these soils with compacted structural fill upon which conventional spread and continuous wall foundations would be established. The primary purpose here would be to re-utilize as much of the excavated non-engineered as possible. However because of the randomness of the fill, the extensive deposits of coal, and underlying natural topsoil there would be a significant amount of material that could not be re-utilized. These materials could contain significant concentrations of lead which would pose a handling and disposal problem.

Because of the concern as expressed above, we have also evaluated the utilization of geopiers beneath the proposed footings for the condominium structures. These are essentially two to four-foot diameter vertical excavations which would extend though the non-engineered fills, topsoil, and

into the underlying dense granular soils. Once excavated, the excavations are then backfilled with clean granular soils which are placed in relatively loose lifts with each lift being heavily compacted by drop hammer. When completed, we essentially have a series of high density vertical granular fill columns. As the result of the compaction operation and fairly close spacing the remaining soils between each individual vertical gravel piers also becomes more highly densified. Subsequently footings are placed over the geopier grid. Some geopiers may also be installed beneath the at-grade parking level slab in order to try to control long-term slab settlements. AGRA has worked with Geopier on numerous projected in the Salt Lake Valley over the last five to seven years and have found the system to be extremely viable and cost effective. The primary advantage in this particular case is the tremendous reduction in the amount of soil cuttings soils which would result. These soils would be essentially mixed, most likely have lower overall lead concentrations, and hopefully would be and be able to be re-utilized in landscaped areas across the site.

5.2 HANDLING OF LEAD CONTAMINATED SOILS

Soils generated by the installation of the geopiers can be handled in a manner which is both protective of human health and the environment and which is economically feasible. The options consist of:

1. Containment on-site beneath the parking garage floor and/or exterior driveway and parking surfaces. Environmental exposure pathways would be effectively eliminated as a health concern.

2. Removal and disposal of soils to the Summit County landfill. This option is contingent on the analytical results from samples collected from the soils generated by the geopiers.

3. Removal and disposal of soils to regulated hazardous water landfill. Again, this option is contingent on the analytical results from samples collected from the soils generated by the geopiers.

We are of the opinion that this project can be successfully undertaken utilizing Options 1 and 2 singularly or in combination depending on the final grade plans.

AGRA

We appreciate the opportunity of providing this service for you. If you have any questions or require additional information, please do not hesitate to contact us.

Respectfully submitted,

AGRA Earth & Environmental, Inc.

William J. Gordon, State of Utah No. 14641
Professional Engineer

and

Raymond J. Stillwell, P.E.
Manager of Environmental Services

WJG/RJS:sn

Addressee (3)

AGRA